CLAIMS

1. A laser apparatus operable at a plurality of operating frequencies over an optical frequency range comprising a laser source for generating an output beam of light having an output frequency, an output phase and an output power and for generating a reference beam of light, a first optical detector for receiving at least a portion of the output beam of light and generating a first signal, a second optical detector for receiving at least a portion of the reference beam of light and generating a second signal, a calibration memory for storing an optimum ratio of the first signal to the second signal and a control unit coupled to the calibration memory and the first and second optical detectors and the laser source for generating at least one control signal based on the optimum ratio.

2. A laser apparatus according to Claim 1, wherein the calibration memory has a look-up table for storing a plurality of optimum ratios as a function of respective operating frequencies whereby said optimum ratio is determined, at least in part, by the operating frequency of said laser apparatus.

3. A laser apparatus according to Claim 1, wherein the calibration memory stores a relationship between said optimum ratio and the operating frequency of said laser apparatus, the control unit being operable to calculate said optimum ratio.

4. A laser apparatus according to Claim 1, wherein the laser source is part of a variable length optical resonator having a mirror and a diffraction grating, the variable length optical resonator further comprising a first actuator coupled to the mirror and a second actuator coupled to the diffraction grating for selecting the output frequency of the output beam of light and the cavity length.

5. The apparatus of Claim 4, wherein the first actuator is a MEMS actuator and the second actuator is a piezoelectric translator.

6. The apparatus of Claim 1, wherein the first optical detector is operable to measure the power of at least a portion of the output beam of light for providing a representation of such measured power in the first signal.

7. The apparatus of Claim 1, further comprising an optical power divider for dividing the reference beam of light into first and second portions and wherein the second optical detector is part of a wavelength locker

8. The apparatus of Claim 7, wherein the second optical detector is operable to measure the power of first portion of the reference beam of light for providing a representation of such measured power in the second signal.

9. The apparatus of Claim 1, wherein the laser source includes a laser diode.

10. A control unit for use with a tunable laser having a laser source and a calibration memory to inhibit mode hops during tuning of the tunable laser to a target frequency, comprising:

at least one input port adapted for coupling to the calibration memory to receive an optimum power ratio from the calibration memory;

at least one output port adapted for coupling to the laser source to provide a laser control signal to the tunable laser; and

a digital signal processor connected to the at least one input port and the at least one output port for utilizing the optimum power ratio to develop the control signal to the tunable laser.

11. The control unit of claim 10, further comprising:

a laser source power control circuit;

a MEMS control circuit;

a PZT length control circuit; and

a setpoint and servo memory unit.

12. A method for tuning a laser apparatus operable over an optical frequency range having a laser source providing first and second beams of light , comprising specifying a target frequency, specifying an optimum power ratio between the first and second beams of light, generating a first control signal to the laser source for coarsely tuning the laser source to a target frequency range which includes the target frequency and generating a second control signal to the laser source to achieve the optimum power ratio.

13. A method according to Claim 12, further comprising generating a fine tuning control signal to the laser source for tuning the laser source to the target frequency while maintaining the optimum power ratio.

14. A method according to Claim 12, further comprising calibrating said laser apparatus to determine said optimum power ratio.

15. A method according to Claim 12, further comprising calculating said optimum power ratio based on said target frequency.

16. A method according to claim 12, further comprising generating at least one fine tuning control signal operable to stabilize said laser apparatus at said target frequency while maintaining said optimum power ratio.

17. A method according to claim 16, wherein said first beam of light is characterized by at least one output characteristic, and said laser apparatus is characterized by

at least one control variable, and wherein the fine tuning control signal is generated based on at least one relationship between said output characteristic and said control variable determined during a calibration of said laser apparatus.

18. A method for sweep tuning a laser apparatus operable over a range of operating frequencies and having a laser source operable by a first control signal to generate an output beam of light and a reference beam of light, comprising providing a plurality of coarse wavelength setpoints over a specified portion of the range of operating frequencies, varying the first control signal to the laser to vary the wavelength setpoint over the portion of the range of operating frequencies, dynamically calculating an optimum power ratio between the first and second beams of light as the wavelength setpoint is varied and generating a second control signal for the laser source to maintain said optimum power ratio.

19. A method according to claim 18 wherein the step of dynamically calculating the optimum power ratio comprises interpolating between optimum power ratio values stored in a look-up table.

20. A method according to claim 18 wherein the step of dynamically calculating the optimum power ratio comprises calculating the optimum power ratio using a relationship between the optimum power ratio and the wavelength setpoint.